



COMMUNICATIONS, INC.

SERVICE MANUAL

VHF MOBILE
AMPLIFIER/CHARGER

MODEL ARU8K4 MA357H

SECTION 1 PERFORMANCE SPECIFICATIONS

Display Name.....

To Substation.....

Output Power.....

Supply Voltage.....

DC Input Current.....

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The MA357H is a high power, high efficiency, portable, self-contained, and rugged, all-in-one, radio transmitter, receiver, and amplifier. It is designed for use in the field and is capable of operating on a variety of frequencies. The transmitter is capable of transmitting up to 100 watts of power and the receiver is capable of receiving signals from a distance of 100 miles. The amplifier is capable of amplifying signals up to 100 times their original strength. The MA357H is a versatile and reliable piece of equipment that is essential for any field operation.

SECTION 2 - OPERATION

After inspection of the portable unit, the operator should be able to identify the various parts of the unit. The operator should be able to identify the antenna, the transmitter, the receiver, and the amplifier. The operator should be able to identify the various controls of the unit, such as the power switch, the frequency selector, and the volume control. The operator should be able to identify the various indicators of the unit, such as the power meter, the frequency meter, and the signal strength indicator. The operator should be able to identify the various accessories of the unit, such as the antenna cable, the power cord, and the carrying case. The operator should be able to identify the various safety features of the unit, such as the emergency stop button and the safety interlock. The operator should be able to identify the various maintenance features of the unit, such as the oil level indicator and the filter indicator. The operator should be able to identify the various operating procedures of the unit, such as the start-up procedure, the operating procedure, and the shutdown procedure. The operator should be able to identify the various troubleshooting procedures of the unit, such as the power problem, the frequency problem, and the signal strength problem. The operator should be able to identify the various safety procedures of the unit, such as the emergency stop procedure and the safety interlock procedure. The operator should be able to identify the various maintenance procedures of the unit, such as the oil level procedure and the filter procedure. The operator should be able to identify the various operating procedures of the unit, such as the start-up procedure, the operating procedure, and the shutdown procedure. The operator should be able to identify the various troubleshooting procedures of the unit, such as the power problem, the frequency problem, and the signal strength problem. The operator should be able to identify the various safety procedures of the unit, such as the emergency stop procedure and the safety interlock procedure. The operator should be able to identify the various maintenance procedures of the unit, such as the oil level procedure and the filter procedure.

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SECTION 1 - PERFORMANCE SPECIFICATIONS

Frequency Range.....	140 - 174 MHz
TX Bandwidth.....	8 MHz
Output Power.....	40W for 5.0W drive
.....	20W for 2.5W drive
Supply Voltage.....	13.8 VDC
DC Input Current.....	0.5A RX w 5.0W audio output
.....	3.7A for 20W output
.....	5.0A for 40W output
Input/Output Impedance.....	50 ohms
Spurious.....	60dB below carrier
Audio Output.....	5.0W at 10% distortion
Battery Charge Rate.....	Fast: 140Ma
.....	Trickle: 50Ma
Battery Elimination Mode.....	Normal 11.25 volts at up to
.....	1.0 amp current is supplied
.....	to the portable in the dead-
.....	battery mode
Operating Temperature.....	-30° to +60° C
Weight.....	2 3/4 pounds
Size.....	3 3/8" H x 6 1/2" W x 7 1/4" DP
Color.....	Black

SECTION 2 - GENERAL DESCRIPTION

The MA357H is a mobile mounted Amplifier/Charger consisting of an internal RF power amplifier, automatic fast/trickle charger, and 5 watt audio amplifier stage. The unit operates from 13.8 VDC negative ground and provides 40 watt RF power output when driven by a Regency MCPH401A portable. Other power inputs will result in different power outputs. The units can be driven with up to 6 watts of power. Base station operation is possible from a regulated 13.8 VDC source of appropriate current capacity.

SECTION 3 - OPERATION

After insertion of the portable unit, connection must be made via the antenna plug. During periods of reception, an internal RF sensing circuit bypasses the internal RF amplifier thereby providing a direct connection between the portable and an outside antenna. External speaker volume is controlled by the portable's volume control. During transmission, the RF sensing circuit will route the RF power through the RF amplifier circuit, and the TX indicator will glow. Amplifier operation is broadband and requires no tuning. Battery charging is automatic through a voltage sensing circuit which switches charging rate from fast (140 mA) to trickle (40 mA) when the battery approaches full charge. During mobile operation, the sensing circuit may switch between full charge (red) and trickle (green) with changes in engine speed when the fast/trickle threshold has just been reached.

SECTION 4 - INSTALLATION NOTES

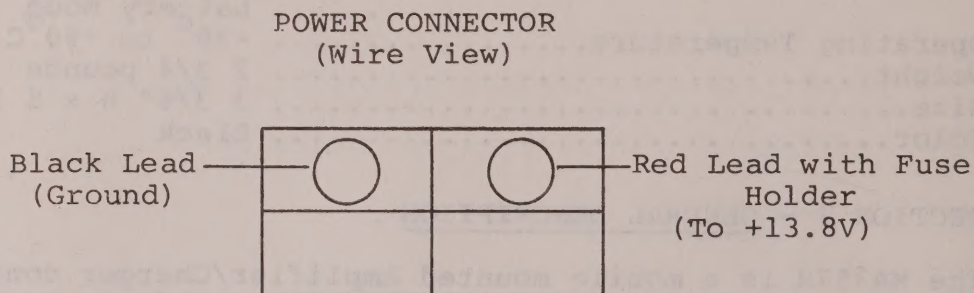
MECHANICAL

The Mobile Amplifier Charger is supplied with a universal mounting bracket which can be placed above or below the unit. After bracket installation, the unit is attached to the bracket via Allen screws and lockwashers which allow for locking the unit in a tilted position.

ELECTRICAL

Power connections are made via the self-locking connector on the rear of the unit. It is recommended that power be obtained directly from the battery using 14 gauge wire.

It is necessary to have full electrical system voltage available at the power connector in order to realize full RF power output. Plug wiring is as follows:



AMPLIFIER

Although the RF amplifier is of broadband design, optimum RF power output at a particular frequency can be obtained by desoldering the small input tuning capacitor (C2) located on the input inductor approximately halfway between the input coupling capacitor and the transistor base. (The transistor base can be identified by the large capacitor between it and ground.) The small capacitor can then be moved slightly right or left until the point of maximum power output is found. The capacitor should then be resoldered at its new location.

CHARGER

Regular to trickle set point voltage should be set to a recommended 13.9 volts via the potentiometer R104 mounted on the charger board. To accomplish this setting, use a variable power supply with a resistor of approximately 20 ohms at 10 watts across the output to simulate a "variable voltage battery".

The variable power supply should be connected across the battery charging contacts inside the unit. Power supply output should then be set to 13.9 volts on an accurate digital voltmeter. The set point potentiometer R104 can then be adjusted first counter-clockwise for a full charge (red) indication and then clockwise until the trickle (green) indicator just comes on.

Please note that variations in engine speed or activation of the transmitter when the charger has recently switched to trickle can cause the charger to return to regular and back to trickle. This situation will not harm the battery in any way.

SECTION 5 - THEORY OF OPERATION

RF SNIFFER

Transmit and receive switching is accomplished automatically by the RF sniffer circuit. A small portion of the incoming RF is sampled, rectified by voltage doubler D1 and D2 and used to drive keying transistor Q2 into saturation. This transistor controls relay K1 which provides a straight-through connection between input and output. Upon transmitting, the relay re-connects the input and output to the internal amplifier circuitry. Minimum drive level required to key K1 is 1 to 1.5 watts.

RF AMPLIFIER

A single transistor class C amplifier stage is used for RF amplification in the MA357H. Coupling capacitor C1 couples the RF from the driver to the input impedance matching network L1, C2, and L2. The purpose of this circuit is to match a 50 ohm source to the low base input impedance of transistor Q1.

Capacitor C3 is used to cancel the internal input inductive reactance making the input impedance of Q1 nearly resistive. RFC 1 provides a DC path for Q1's base current which flows when drive is applied. Likewise, output network L3, C4, and L4 match the collector (output) impedance of Q1 to a 50 ohm load. An inductive reactance cancelling capacitor is not used in this model from collector to ground as the reactance is fairly high, making this capacitor have a very small (negligible) value. DC feed for Q1 is provided through RFC 2 with DC bypass provided by C5, C6, and C7. Spurious emission is attenuated by a seven-pole high-pass filter consisting of L5, L6, L7, C9, C10, C11, and C12.

CHARGER

IC101, running as an astable multivibrator in combination with voltage doubler D101 and D102 step up the 12 - 13 volt input to 20 volts. R117 serves as a current limiter. IC103, a voltage comparator, senses the voltage level of the battery under charge in respect to voltage reference D103. When the battery voltage is below the level preset by R104, Q102 saturates thereby turning on Q101 and D105. Under this condition, a full charge is applied to the battery. Upon reaching full charge, IC103 switches causing Q101 to open. Charge current then flows through D104 and R106 which limits charging current to 30 - 50 mA.

AUDIO AMPLIFIER

IC102 is the power audio amplifier. It raises the portable 0.5 watt output to a 5.0 watt output to drive the external speaker.

SECTION 6 - MAINTENANCE

ELECTRICAL PROBLEMS

Consult Section 5 "Theory of Operation" and the Schematic Diagrams and Parts Placement Diagram for the P.C. Board requiring maintenance.

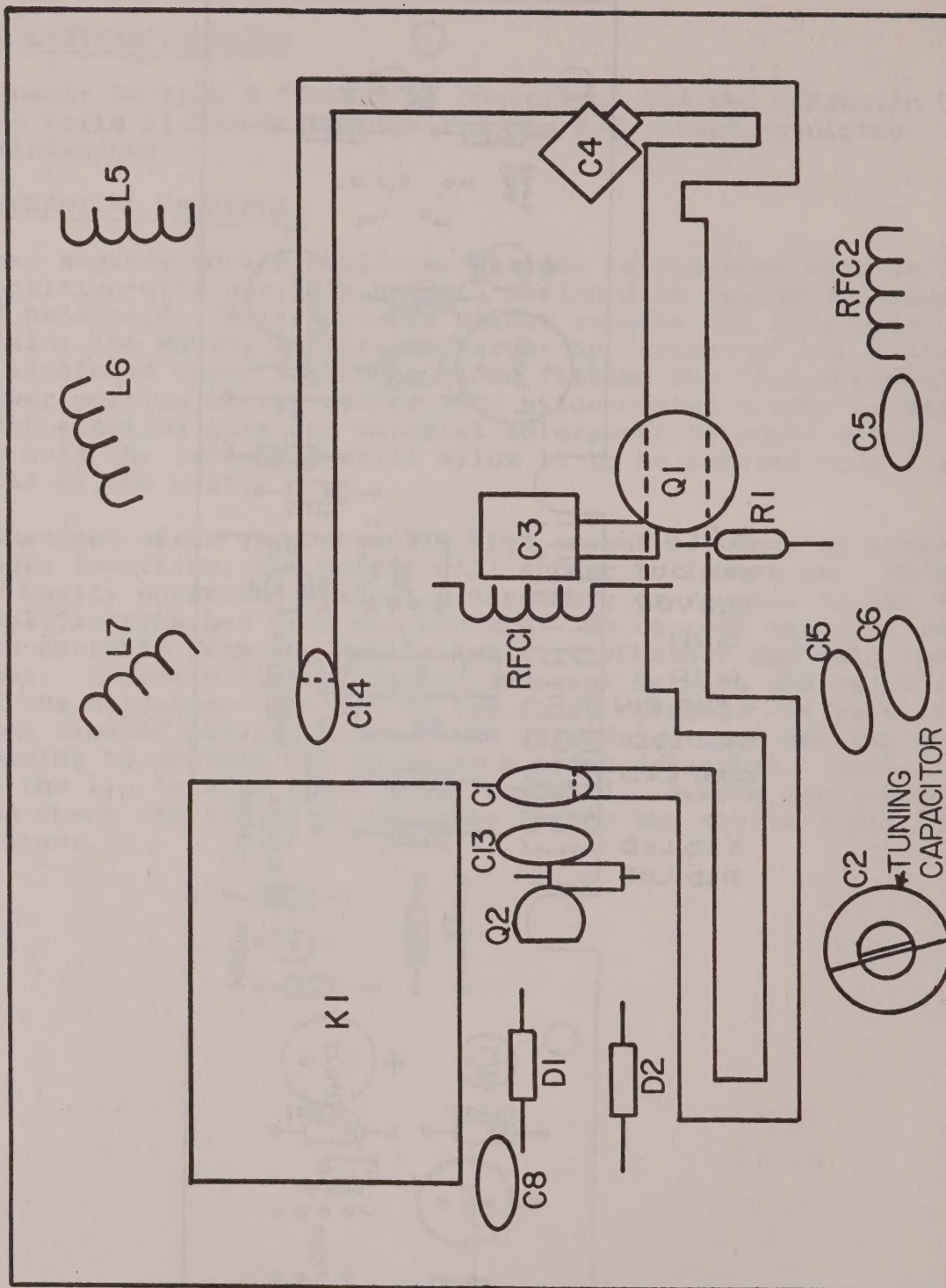
MECHANICAL PROBLEMS

Your Regency Mobile Amplifier/Charger is equipped with an internal "positive-grip portable holder" designed to custom fit your model of hand-held. This portable holder retains the hand-held unit inside the Mobile Amplifier/Charger by "gripping" the radio with a tensioned upper lip and a close fitting cup that surrounds the lower portion of the radio. The nylon-coated holder is made with exacting size and material tolerances to apply enough tension to hold the radio and still allow it to be removed with a slight pull of the unit.

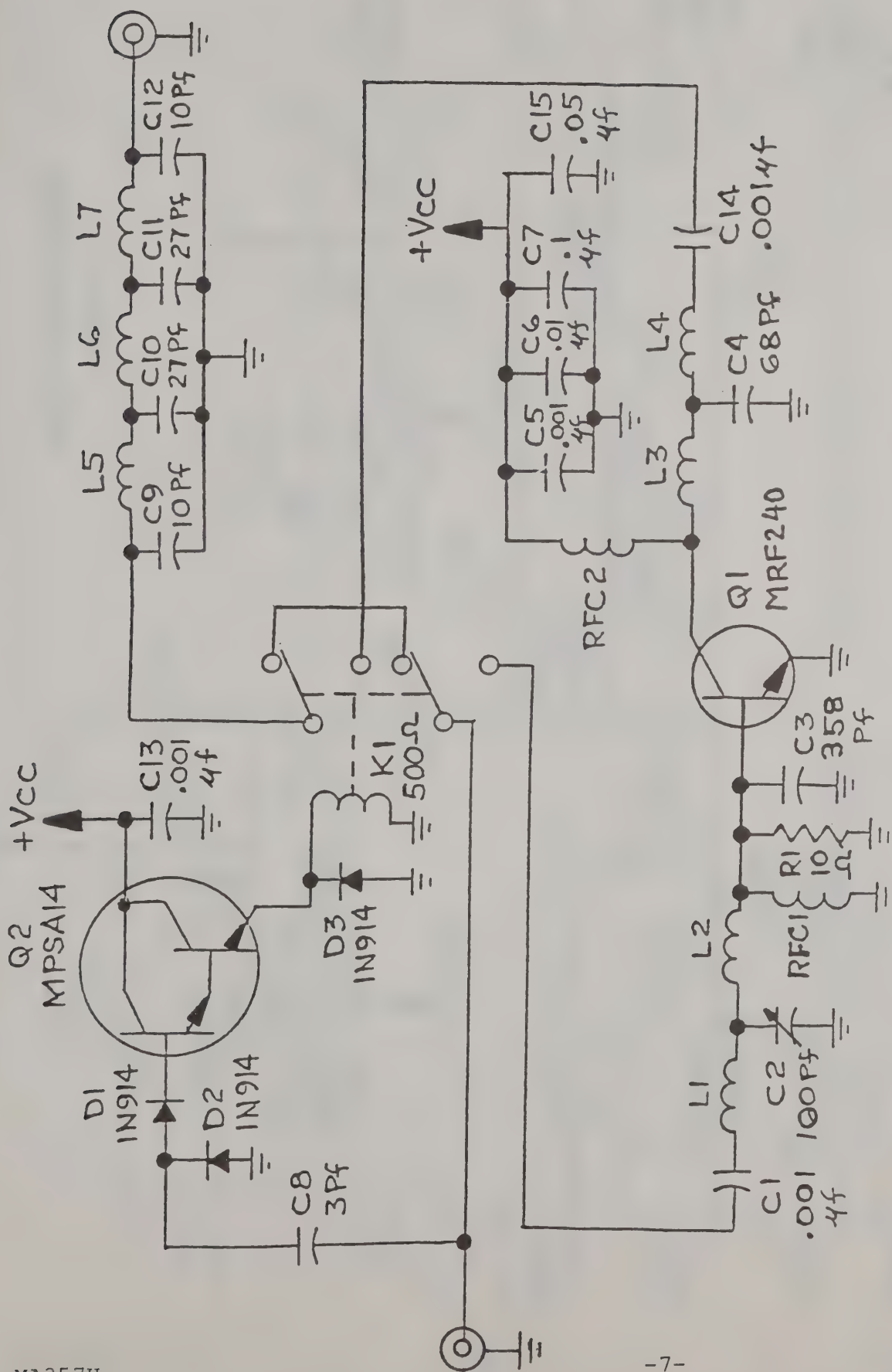
Sometimes after an abnormally high amount of usage or improper radio insertion, the holder will appear to loosen up. This can be easily corrected without disassembly or removal of the Mobile Amplifier/Charger from the vehicle. To correct tension, remove the portable from the Mobile Amplifier/Charger and hold open the door. Insert a flat-bladed screwdriver between the upper lip of the holder and the top of the front opening. Be sure to use some type of padding between the screwdriver and the top front opening to prevent the paint from being scratched. Apply leverage to the lip to move it slightly downward. Remove the screwdriver and check the fit of the portable inside the Mobile Amplifier/Charger.

[illegible]

MA357H



PARTS PLACEMENT
VHF POWER AMPLIFIER



SCHEMATIC
VHF POWER AMPLIFIER

SECTION 9 - PARTS LIST- MA357H

	Location	Description	Trilectric Part Number
Capacitors	C1	.001 mf	01002
	C2	100 pf (tunable)	01023
	C3	358 pf	01017
	C4	68 pf	01015
	C5	.001 mf	01002
	C6	.01 mf	01004
	C7	.1 mf	01007
	C8	3 pf	01001
	C9	10 pf	01011
	C10	27 pf	01012
	C11	27 pf	01012
	C12	10 pf	01011
	C13	.001 mf	01002
	C14	.001 mf	01002
	C15	.05 mf	01005
	C101	.005 mf	01003
	C102	220 mf (elect)	01009
	C103	220 mf (elect)	01009
	C104	10 mf (elect)	01008
	C105	10 mf (elect)	01008
	C106	220 mf (elect)	01009
	C107	10 mf (elect)	01008
	C108	10 mf (elect)	01008
	C109	1000 mf (elect)	01010

Resistors (All resistors are 5%, 1/4 watt unless otherwise noted)

R1	10	02002
R101	10	02002
R102	1K	02008
R103	4.7K	02013
R104	10K (Var)	03001
R105	270	02015
R106	150	02005
R107	1.2K	02016
R108	1.2K	02016
R109	2.7K	02017
R110	10K	02010
R111	1.2K	02016
R112	1.2K	02016
R113	2.2K	02009
R114	150	02005
R115	220	02012
R116	2.2	02011

PARTS LIST - MA357H (Continued)

	Location	Description	Trilectric Part Number
Diodes	D1	IN914	04002
	D2	IN914	04002
	D3	IN914	04002
	D101	IN4001	04001
	D102	IN4001	04001
	D103	IN751 (zener 5.1 v)	04003
	D104	Green LED	05002
	D105	Red LED	05001
	D106	IN4001	04001
	D107	IN4001	04001
	D108	IN4001	04001
Transistors	Q1	MRF240	08002
	Q2	MPSA14	08001
	Q101	2N3906	08010
	Q102	2N3904	08004
Integrated Circuits	IC101	NE555	08005
	IC102	LM383	08007
	IC103	LM741	08006
LED	Front	Red	05001
LED	Front	Green	05002
Speaker	Top		22002
Bracket			23001
Switch	Front	On/Off	11001
Connector, 6-pin	Front	Female, Spkr mic	RCI P/N 2105-0846-880

SERVICE BULLETINS

82-245 (W)	MCA611 1. Errors in service manual. 2. K1 jumper too short. 3. Possibility of tone decoder falsing with harmonics.
82-246	Cancelled
82-247 (W)	MA-325 Interference fit when mounting option board to a "Rev" N control board.
82-248 (G)	XLH252/257; XLHC252/257 Design changes to improve radio performance in high systems noise environments.
82-249 (B)	XLU152/1515 Design changes to improve radio performance in high systems noise environments.
82-250 (G)	XLH257 Parts placement of control board has wrong component designation on the volume pot.
82-251 (W)	BAH100 Service manual errata.
82-252 (B)	MCU31, 31H, 34, 34H, MCBU19/35 - Main boards (704-064) (704-021) Transmitter not stable on initial keying.
82-253 (B)	ACU45A/AASCU45A Changes of parts of new models. Models in field not affected.
82-254 (G)	XLH252/257 Recent changes to reduce vehicular generated noise have inherently lowered microphone gain by 6.6 db.
82-255 (G)	XLHC252/257 Incorrectly labeled part on parts placement diagram.
82-256 (G)	XLH252ABC Assembly change.
82-257 (G)	XLH257/XLHC257 Service manual errata.
82-258 (G)	MCH40, MCL60, MCBH45, MCCH06, MCCH09 Polarity of electrolytic capacitor in the audio amp is reversed resulting in possibility of low or distorted audio.
82-259 (B)	XLU1515 when used with MA329 Radio will not step through all channels.

SERVICE BULLETINS (CONT.)

- 82-260 (G) MCMH11 (units manufactured after Nov. 1980)
Low frequency audio distortion.
- 82-261 (W) MA337
The MA337 decodes other ID codes along with the correct ID code.
- 82-262 (B) XLU152/1515
To convert "A" range to "B" range.
- 82-263 (W) XLU152 - XLU1515
Inferior transmit hum and noise.
- 82-264 (W) MA355
Scanner continues to scan or jumps the channel when transmitter is keyed.
- 82-265 (B) XLU & XLH Series Radios
On radios which have a ceramic disc version of C502 installed to reduce the transmit distortion of low frequency transmitted tones between 67Hz and 130Hz (SB82-240) decode sensitivity may be adversely affected due to inherent capacitor D.C. current leakage.
- 82-266 (B) XLU1515
Service manual errata.
- 82-267 (W) MA357H
Drive power information.
- 82-268 (W) MCA611A
Service manual errata.
- 82-269 (W) MA332
Service manual changes.
- 82-270 (W) MA330's shipped between July 1982 and August 1982
Excessive base tone in transmit audio.
- 82-271 (G) XLH252
Self-quieting spur frequencies in order of prominence.
- 82-272 (Y) MCL 60 PA deck (all ranges)
Production changes.
- 82-273 (W) MA312
Motor boating sound in audio of MA312 when in "Intercom" or "Busy" modes. Difficult adjustment of R727.
- 82-274 (W) MA312
Service manual changes.
- 82-275 (W) MCA611A
Speaker "Pop" in monitor mode with receiver squelched.

W = White B = Blue
G = Green Y = Yellow

SERVICE BULLETINS (CONT.)

82-280 (G)	ACM117 units manufactured after Nov. 1980. For frequency audio detection.
82-281 (W)	MA331 The MA331 requires other ID codes along with the correct ID code.
82-282 (B)	XLU151/151S To correct "A" range to "B" range.
82-283 (W)	XLU182, XLU181S Interferes with hunt and noise.
82-284 (W)	MA352 Scanner continues to scan at 100% the channel when transmitter is keyed.
82-285 (B)	XLU & XLU Series Radios On radios which have a ceramic disk version of 100% installed to reduce the transmit distance of low frequency transmitted tones for when 67Hz and 130Hz 100% tones are transmitted they be advised if affected due to incorrect operation of C, current leakage.
82-286 (B)	XLU151S Service manual errors.
82-287 (W)	MA353H Days power information.
82-288 (W)	MCAG1A Service manual errors.
82-289 (W)	MA352 Service manual changes.
82-290 (W)	MA350 a trip between July 1982 and August 1982. Excessive bass tone in transmit audio.
82-291 (G)	20-4583 Self-heating spot frequencies in order of transmission.
82-292 (Y)	REC 02 PA deck fall impact Production changes.
82-293 (W)	MA312 Motor bearing sound in audio of MA312 when in "Intercom" or "Scan" mode. Difficult adjustment at 6732.
82-294 (W)	MA312 Service manual changes.
82-295 (W)	MCAG1A Speaker "Pop" in monitor mode with receiver squelched.